

Application for Erie County Executive Energy Achievement Award  
March 15, 2006

Name of Project:

**“Adventure in Solar Living:  
Home as Energy Learning Lab and Teaching Tool”**

**Contact Info:**

Walter and Nan Simpson  
4 Meadowstream Court  
Amherst, N.Y. 14226  
829-2515 (office/Walter)

**Project Conception and Completion:**

1990 – present. It is on-going.

**Describe initial condition and goals of project:**

When we moved into our 1600 square foot ranch house in 1990, it was apparent that it could function as a passive solar home (given its numerous south facing windows and unobstructed solar access) but only if the building envelope was energy efficient enough. That led to our implementing a “super-insulation retrofit” of the house to greatly increase insulation levels to R-30 walls, R-45 cathedral ceilings, and R-50 attic.

This first step was followed by numerous other efficiency and solar improvements over the years. By accident and design our house became an energy learning lab. We also wanted it to be a teaching tool. As a result, we have published articles and made presentations at workshops and conferences about our energy adventures in this house, and we have often invited students and members of the community to visit the house to learn about energy conservation strategies and the potential of solar energy in the Buffalo climate. When asked if solar works in Buffalo, we can answer with a resounding “Yes!” because we have lived it.

**Was renewable energy considered and how?**

Yes, the initial goal was to make solar energy work for space heating. Our 240 square feet of south facing glass provide daylighting and serve as our solar furnace. After super-insulating the house, the “solar fraction” was measured at 33%, i.e. one third of our heating was being supplied by sunlight – even in Buffalo with our cold and sometimes cloudy winters. It was great fun watching our house maintain indoor temperature with the furnace off on a sunny 10 degree day. Even on cloudy bright days our furnace stays off during daylight hours. We later added solar hot water which meets over half of our hot water needs. And we purchase green power to meet our electricity needs -- 100% new wind energy from Community Energy.

**What steps were taken to achieve this goal?**

See attached article from Solar Today (September/October 2003). It details all steps taken. A shorter earlier article about our house was published in the Buffalo News.

### **What were the obstacles?**

While the initial super-insulation retrofit was undertaken with paid part-time helpers and contractors for specific tasks, most of the work was done by us. That meant working very long hours, as much as 80 hour weeks – tearing out perimeter walls and reconstructing them to super-insulation levels. We developed and used a super-insulation technique relying on high density, high R-value fiberglass batts and expanded polystyrene (EPS) rigid board. We chose EPS insulation because it was reasonably environmentally friendly (no ozone layer-depleting emissions). EPS enabled us to avoid wood studding to increase the thickness of exterior walls – thus saving wood resources. We also added a substantial amount of insulation to the attic. Overall, the costs and amount of work involved in the initial super-insulation retrofit was double what was anticipated. But worth it.

When we installed the solar hot water system (2001), we could not find anyone locally to do the work so we had to do it ourselves with the help of some untrained workshop participants and a local plumber who had never seen a solar hot water system. This turned out to be a four month project including the design work which we also had to do ourselves.

When we replaced all windows in the house with triple glazed, double low-e coat argon and krypton gas-filled insulating glass units (2003), we insisted on buying the most thermally advanced windows we could find and tailoring the specifications so that the solar heat gain coefficient would be as high as possible in order to maintain solar gain through south-facing windows while at the same time vastly increasing the insulating value of the glass from R-2 to R-7. To accomplish this, we worked with a window consultant and had to develop a special arrangement with our contractor to permit the purchase and installation of windows he normally would not have used. We also developed special “warm edge” glass insulating installation techniques to avoid loss of R-value around the glass edges (where R-value typically drops off significantly).

### **What support was received for this project?**

For the window replacement, there was a modest incentive from NYSERDA. Otherwise all energy improvements were paid by us, the homeowners.

### **Projected payback?**

We undertook these energy retrofits and improvements because they were the right thing to do and because, by doing them, we would learn about building energy performance, the feasibility and potential of solar energy in Buffalo, and be able to teach others and better advocate for a sustainable energy future. Payback was not a consideration. Paybacks for the super-insulation retrofit and solar hot water system were in the 15-30 years range. The energy payback on the windows could be as low as 8 years, depending on how calculated. Implementing these projects also taught us how paybacks could be reduced to make the steps we took more acceptable to other homeowners.

### **Results of project?**

The highest winter month's natural gas bills are in the \$90-120 range (even with the high price of natural gas). About 80% of that is for space heating. As previously stated, about one third of the space heating is accomplished by solar energy as is over half of the domestic hot water heating. Because we actively conserve electricity, electrical consumption is generally in the 250-275 KWH/month range, which means that the premium cost of

meeting that modest load with 100% wind energy is only about \$6 a month added to our electric bill – a very small price to pay to quit the coal and nuclear power habit!

Our house is draft free (blower door tested at 0.33 air changes per hour) – guaranteeing maximum efficiency without indoor air quality problems. Zero drafts coupled with warm walls and windows (due to unusually high insulation levels) have made our house comfortable even at cooler temperatures, e.g. 63-64 degrees. All living spaces with the exception of the bathroom are beautifully daylit, providing better quality light while saving electricity. Big south-facing windows mean no cabin fever.

We estimate that overall energy savings are in excess of 50% compared to a conventional house and a conventional family.

Additionally, many people have benefited by the lessons we have learned by doing this work. Our house has been on the local Tour of Solar Homes a number of times. Classes of students have visited for intensive lessons in home energy conservation and solar energy basics. By implementing these retrofits and undertaking much of the work ourselves -- getting involved designing, installing, maintaining, and measuring the results – we have become much more knowledgeable and better able to serve as teachers, mentors, and advocates.

**Are we willing to mentor?**

Yes, of course!

**Can you post/publish on your website?**

Yes, of course!